

## Statistical Modeling of Phosphine Variation in Saturn's Troposphere

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The 5.2- $\mu\text{m}$  atmospheric window on Saturn is dominated by thermal radiation and weak gaseous absorption, with a 20% contribution from sunlight reflected from clouds. Striking variability was found to be displayed by Saturn's clouds at 5.2  $\mu\text{m}$  (Yanamandra-Fisher *et al.*, 2001). Detection of phosphine (an atmospheric tracer) variability near or below the 2-bar level and possibly at lower pressures provide salient constraints on the dynamical organization of Saturn's atmosphere by constraining the strength of vertical motions at two levels across the disk. We model the 5.2-micron spectra of Saturn by statistical methods, primarily principal component analysis (PCA) technique (Yanamandra-Fisher *et al.*, 2002). The PCA method identifies the predominant spatial and spectral relationships in the data by indentifying internal correlations within the data. It allows a linear representation of the statistical data with a minimal number of independent variables. Our initial goals are: the identification of spectral relationships; determination of the spatial variability of phosphine in Saturn's atmosphere; and validation of the results from physical models.

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1. Yanamandra-Fisher *et al.*, 2001. *Icarus*, 150, 189 - 193.
2. Yanamandra-Fisher *et al.*, 2002. *SPIE*, (in press).